

An Upgraded Advanced Photon Source Lights the Way to Innovation

The opportunity for better drugs, a cleaner environment, higher-performance electronics, and an economically competitive nation lies in finding new and better ways to do things. It lies in the innovations that science enables. And scientists in nearly every field say that to expedite innovation they need to view matter in more detail and in more conditions and time scales than today's synchrotron X-ray technology allows.

The upgrade of the Advanced Photon Source will meet these needs with system-wide improvements that will expand its X-ray research capabilities a thousandfold. The APS will be brighter, faster, better. That will enable scientists to look at the ultra small and the ultra fast to complete the picture of how matter is built atom-by-atom and how it functions in real time, in real materials, in real operating conditions, and in extreme environments.

Measuring matter in all conditions is the first step to understanding how to manipulate it to confront the greatest global challenges and engineer a better future. By altering how atoms align and how molecules interact, scientists can optimize positive traits, block negative traits, create new forms of matter, and synthesize limited natural resources.

The upgrade consists of dozens of improvements touching every aspect of the facility, including the development of several one-of-a-kind research tools. Most of the improvements will advance capabilities by several orders of magnitude and secure the APS's role as the world's premier X-ray source for materials science.

Impact

The upgrade of the APS will keep the U.S. at the forefront of X-ray science and provide access for more scientists and experiments. It will open entirely new areas of study in basic research and help expedite product development by expanding the ability to test materials for defects, durability and energy capacity. The upgrade will complement the nation's suite of light sources and provide a bridge to global X-ray free electron laser technology.

Partners

The APS is a highly successful partnership between government, academia and industry. In fiscal year 2012, more than 5,500 researchers from all 50 United States and many 33 foreign countries conducted experiments at the APS. Scientists came from more than 600 U.S. universities, and more than 70 U.S. industries. More than a dozen state and federal institutions use the APS to study materials science, chemistry,



The upgrade of the Advanced Photon Source at Argonne National Laboratory will support innovation to further improvements in electronics, health care, agriculture, sustainable energy, national security, manufacturing, transportation, environmental remediation and cultural preservation.

physics, biology, life science, geoscience, environmental science, and agricultural science. Virtually every large pharmaceutical and biotechnology company operating in the U.S. uses a national X-ray light source.

Funding

The U.S. Department of Energy declared a scientific need for the \$391 million APS upgrade in 2010. Phased approval and construction is ongoing, with new science capabilities becoming available for use from 2015 to the project's expected completion in 2020.

The U.S. Department of Energy's Office of Basic Energy Sciences is funding the APS upgrade. User universities and industries are funding complementary upgrades to individual X-ray laboratories along the APS ring. The State of Illinois is funding construction of the Advanced Protein Crystallization Facility that will complement the upgrade and connect to the APS to expedite biological studies.

More Info

<http://www.aps.anl.gov/Upgrade/>

https://blogs.anl.gov/major_initiatives/hard-x-ray-sciences/



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